

AP Chemistry

Chapter 1 Supplemental Problems

Name: _____ Date: _____ Period: _____

1. Which of the following mixtures are homogeneous and which are heterogeneous? (7)

- a. gasoline
- b. raisin pudding
- c. Italian salad dressing
- d. a cola drink

2. In each case, decide whether the underlined property is a physical or chemical property. (12)

- a. The normal color of elemental bromine is orange.
- b. Iron turns to rust in the presence of air and water.
- c. Hydrogen can explode when ignited in air.
- d. The density of titanium metal is 4.5 g/cm^3
- e. Tin metal melts at 505 K
- f. Chlorophyll, a plant pigment, is green.

3. Which of the following describe a chemical change, and which a physical change? (12)

- a. Sheep are sheared and the wool is spun into yarn.
- b. A cake is baked from a mixture of flour, baking powder, sugar, eggs, shortening, and milk.
- c. Milk turns sour when left out of the refrigerator for many hours.
- d. Silkworms feed on mulberry leaves and produce silk.
- e. An overgrown lawn is manicured by mowing it with a lawn mower.

4. Suggest a way to determine whether the colorless liquid in a beaker is water. If it is water, does it contain dissolved salt? How could you discover whether salt is dissolved in the water? (12)

5. A piece of turquoise is a blue-green solid, and has a density of 2.65 g/cm^3 and a mass of 2.5 g. (14)

- a. Which of these observations are qualitative and which are quantitative?
- b. Which of these observations are extensive and which are intensive?
- c. What is the volume of the piece of turquoise?

6. Iron pyrite is often called “fool’s gold” because it looks like gold. Suppose you have a solid that looks like gold, but you believe it to be fool’s gold. The sample has a mass of 23.5 g. When the sample is lowered into the water in a graduated cylinder, the water level rises from 47.5 mL to 52.2 mL. Is the sample fool’s gold ($d = 5.00 \text{ g/cm}^3$) or “real” gold ($d = 19.3 \text{ g/cm}^3$)? (14)

7. During the 1840s and 1850s, Carl Wunderlich first recognized fever as a symptom of disease and found that the average of a large number of human temperature measurements was 37°C . What is the equivalent Fahrenheit temperature? Modern measurements show the average normal body temperature to be 98.2°F . What is the equivalent Celsius temperature? (16)

8. How many significant figures are there in each of the following measured quantities? (20)

- a. 8008 m
- b. 0.00075 s
- c. 0.049300 g
- d. $6.02 \times 10^5 \text{ m}$
- e. $4.200 \times 10^5 \text{ s}$
- f. 0.1050°C

9. Perform the indicated operations, and give answers with the proper number of significant figures. (20)

- a. $36.5 \text{ m} - 2.16 \text{ m} + 3.452 \text{ m}$
- b. $12.52 \text{ cm} + 5.1 \text{ cm} - 3.18 \text{ cm} - 12.02 \text{ cm}$
- c. $73.0 \text{ mm} \times 1.340 \text{ mm} \times (25.31 \text{ mm} - 1.6 \text{ mm})$
- d. $(2.023 \text{ g} - 1.8 \times 10^{-3} \text{ g}) / 1.05 \times 10^4 \text{ mL}$

10. A student finds that the weight of an empty beaker is 12.024 g. She places a solid in the beaker to give a combined mass of 12.108 g. To how many significant figures is the mass of the solid known? (20)

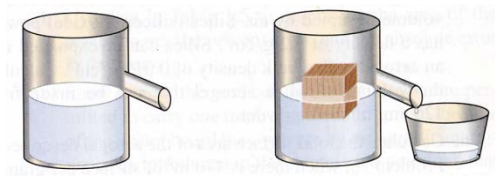
11. The anesthetic procaine hydrochloride is often used to deaden pain during dental surgery. The compound is packaged as a 10.% solution (by mass; $d = 1.0 \text{ g/mL}$) in water. If your dentist injects 0.50 mL of the solution, what mass of procaine hydrochloride (in milligrams) is injected? (23)

12. Diamond has a density of 3.513 g/cm^3 . The mass of diamonds is often measured in “carats”, where 1 carat equals 0.200 g. What is the volume (in cubic centimeters) of a 1.50-carat diamond? (23)

13. A 5.79 mg piece of gold ($d = 19.3 \text{ g/cm}^3$) is hammered into gold leaf of uniform thickness with an area of 44.6 cm^2 . What is the thickness of the gold leaf? (23)

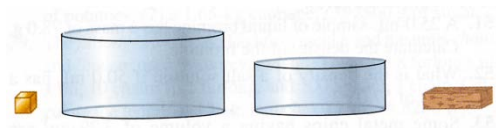
14. Which of the following items would be most difficult to lift onto the back of a pickup truck: (1) a 100-lb bag of potatoes, (2) a 15 gal plastic bottle filled with water, (3) a 3.0 L flask filled with mercury ($d = 13.6 \text{ g/cm}^3$)? (23)

15. The container pictured below on the left is filled with water at 20°C , just to the overflow spout. A cube of wood with edges of 1.0 in is floated on the water, and 10.8 mL of water is collected as shown on the right. Calculate the density of the wood, and express your result with the maximum number of significant figures permitted in this experiment. (23)



16. Aerogels consist of a solid framework with most of their volume occupied by air. Silica (silicon dioxide) powder has a density of 2.2 g/cm^3 . Silica can be expanded into an aerogel with a bulk density of 0.015 g/cm^3 . Calculate the volume of silica aerogel that can be made from 12.5 cm^3 of silica powder. (23)

17. The two vessels shown are completely filled with water. A brass cube 2.0 cm on edge is gently placed on the water in the vessel on the left, and a rectangular block of cork 5.0 cm x 4.0 cm x 2.0 cm on the water in the vessel on the right. The density of brass is 8.40 g/cm^3 and that of cork is 0.22 g/cm^3 . From which vessel will the greater volume of water overflow? (23)



18. On July 23, 1983, Air Canada Flight 143 required 22,300 kg of jet fuel to fly from Montreal to Edmonton. The density of jet fuel is 0.803 g/mL , or 1.77 lb/L . The plane had 7682 L of fuel on board in Montreal. The ground crew there multiplied the 7682 L by the factor 1.77 (without units) and concluded that they needed an additional 8703 kg or 4916 L of fuel for the trip to Edmonton. They added 5000 L. On its flight, the plane ran out of fuel and safely crash-landed near Winnipeg, hundreds of kilometers short of its destination. What mistake did the ground crew make? How much fuel should they have added before takeoff? (23)

Lecture Slide Problems Below

Dimensional analysis

Determine the density of the bar to the correct number of significant digits in units of kg/m^3 .

Example:

Perform the following computation to the correct number of significant digits:

$$(2.763 + 4.7 - 1.113) / 6.775$$

Given the water displacement of the object, if the density of the sample is 1.75 kg/dm^3 , determine the mass (in grams) of the object to the correct number of significant digits.

